

# DoD ERDC-CERL Fuel Cell Demonstration Program

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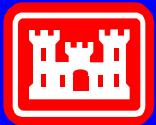
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## 2003 Fuel Cell Seminar

Fontainebleau Hotel

Miami Beach, FL

November 3-6, 2003

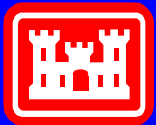


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# DoD Fuel Cell Demonstration Program

- PAFC Demonstration
- Residential PEM Demonstration
- Climate Change Fuel Cell Program
- Fuel Cell Test and Evaluation Center (FC*Tec*)

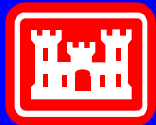


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# **DoD PAFC Demonstration Program**

- **DUECC Request for CERL Assistance**
- **FY93 Congressional Appropriation - \$18M**
- **FY94 Congressional Appropriation - \$18.75M**
- **Specify “...natural gas fuel cells in production in the United States...”**

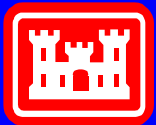


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# Turn-key Package

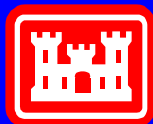
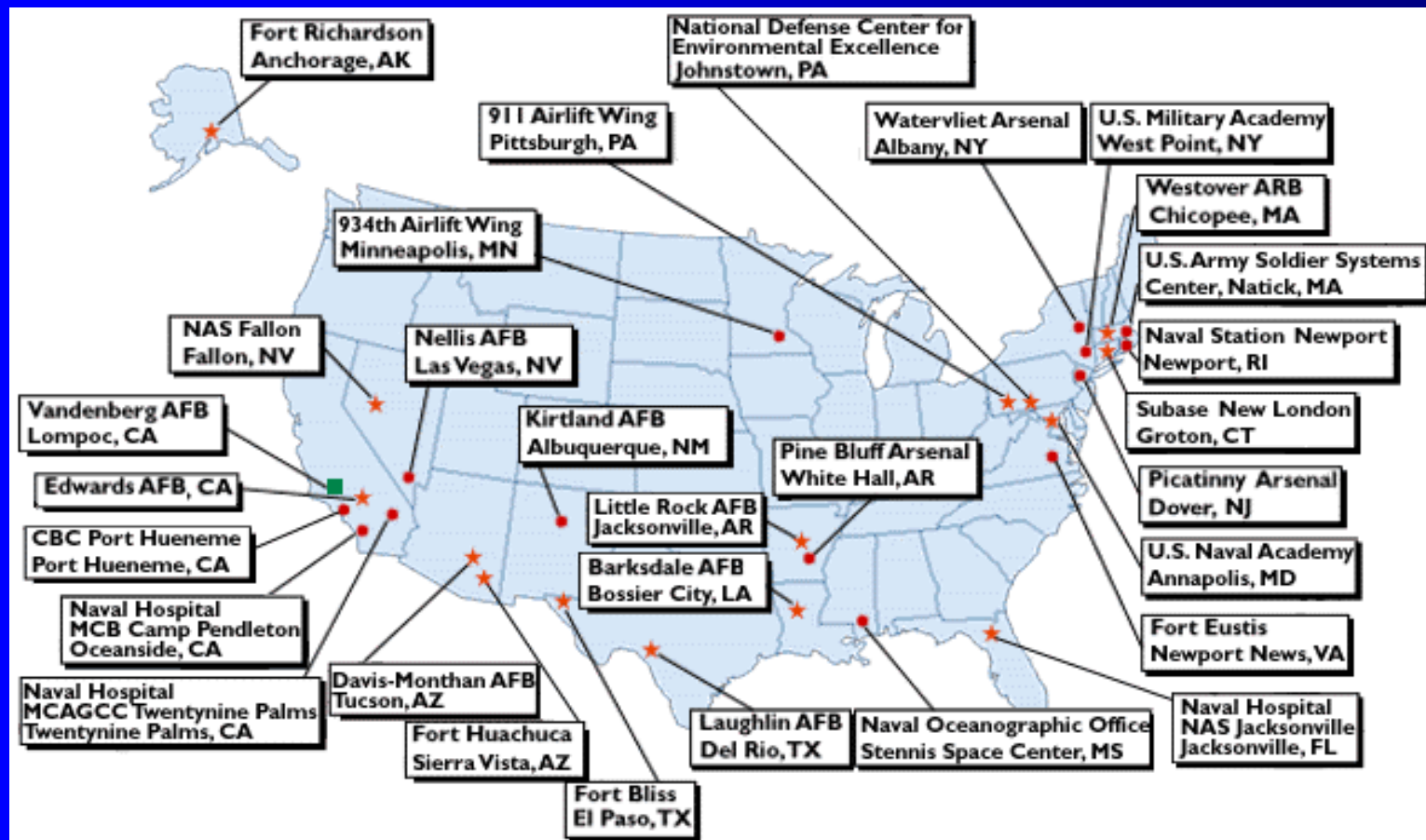
- IFC PC25 Fuel Cell Power Plant
  - Fy93 - 1 ea. Model A, 11 ea. Model B
  - Fy94 - 3 ea. Model B, 15 ea. Model C
- Engineering Design / Installation
- Training for Site Personnel
- 60 Months Maintenance
- Diagnostic / Remote Monitoring Computer



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# DoD PAFC Program Sites



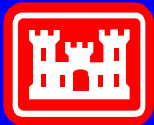
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# Fleet Performance Summary

(29 Power Plants)  
As of October 29, 2003

- Total Run Time 875,346 hrs
- Availability
  - Model B Fleet 57%
  - Model C Fleet 76%
- Energy \$ Saved \$5,959,411
- NOx Abated 281 tons
- SOx Abated 595 tons
- CO Abated 24 tons
- CO<sub>2</sub> Abated 36,043 tons

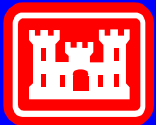


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# **DoD Residential PEM Demonstration Program BAA Requirements**

- **“Domestically Produced” PEM Units, 1 kW to 20 kW**
- **US Military Facilities/Embassies, etc.**
- **Turn-key Packages Requested**
- **Maximum Diversity Desired**
- **1 Year of “Fuel Cell Power” Required  
– (90% Availability)**



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# **“PEM” Program Highlights**

- **Grant Money Available / Fiscal Year**

FY03	~\$ 3.5M
FY02	\$ 3.0M
FY01	\$ 3.0M

- **No Cost-Share Required**

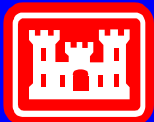
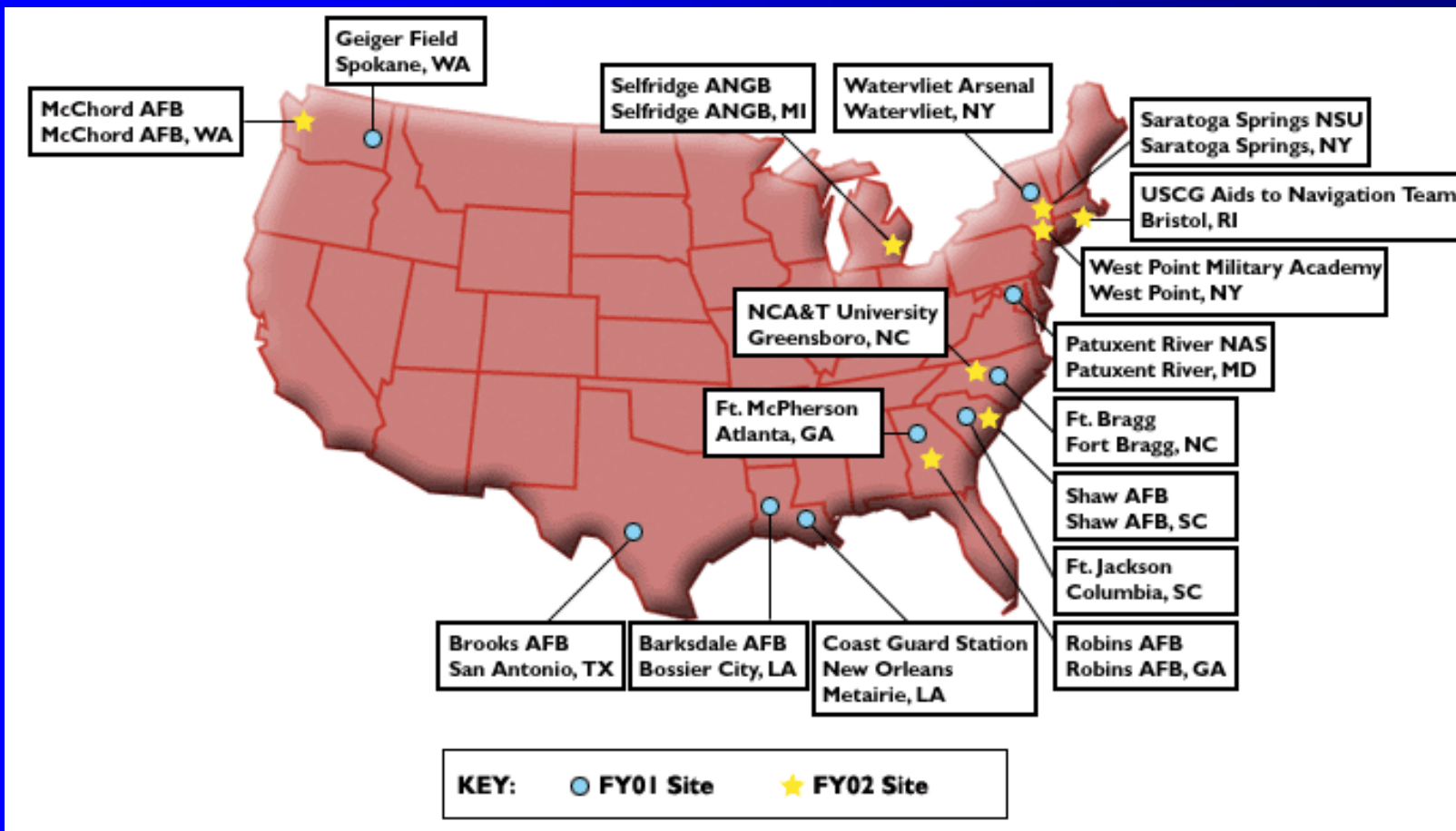


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# FY01-FY02 Residential PEMFC Program Sites

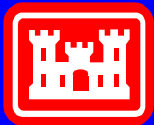


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# FY01 Residential PEMFC Demonstration Program

Site Name	Building Application	Fuel Cell Manufacturer	Input Fuel	Size (kW)	No. Units	Cogen. Y/N
Brooks AFB, TX	Base Housing	Plug Power	Natural Gas	5	3	No
Ft. Bragg, NC	Office Building	Plug Power	Natural Gas	5	1	No
Ft. Jackson, SC	Officer's Quarters	Plug Power	Natural Gas	5	1	Yes
Barksdale AFB, LA	Base Housing	Plug Power	Natural Gas	5	1	No
Ft. McPherson, GA	Base Housing	Plug Power	Natural Gas	5	1	Yes
Coast Guard Station, LA	Administration & Operation Building	Plug Power	Natural Gas	5	1	Yes
Patuxent River NAS, MD	Office Building	Plug Power	Propane	5	1	Yes
Patuxent River NAS, MD	Officer's Quarters	Plug Power	Natural Gas	5	1	Yes
Geiger Field, WA	Maintenance Fac.	Avista Labs	Hydrogen	3	1	No
Watervliet Arsenal, NY	Research Facility	Plug Power	Natural Gas	5	3	No
Watervliet Arsenal, NY	Manufacturing Fac.	Plug Power	Natural Gas	5	3	No
Watervliet Arsenal, NY	Officer's Quarters	Plug Power	Natural Gas	5	4	No

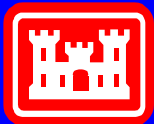


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# FY01 Residential PEMFC Demonstration Program

Site Name	Proposer	Fuel Cell Start-up	Demo End Date
Brooks AFB, TX	Southwest Research Institute	03-Feb-03	N/A
Ft. Bragg, NC	LOGAN Energy	21-Nov-02	N/A
Ft. Jackson, SC	LOGAN Energy	05-Mar-03	N/A
Barksdale AFB, LA	LOGAN Energy	27-Feb-03	N/A
Ft. McPherson, GA	LOGAN Energy	N/A	N/A
Coast Guard Station, LA	LOGAN Energy	N/A	N/A
Patuxent River NAS, MD Office Building	Southern Maryland Electric Cooperative	N/A	N/A
Patuxent River NAS, MD Officer's Quarters	Southern Maryland Electric Cooperative	N/A	N/A
Geiger Field, WA	Avista Laboratories	06-Mar-02	06-Mar-03
Watervliet Arsenal, NY Research Facility	Plug Power	18-Jan-02	18-Jan-03
Watervliet Arsenal, NY Manufacturing Facility	Plug Power	18-Jan-02	18-Jan-03
Watervliet Arsenal, NY Officer's Quarters	Plug Power	15-Jan-02	15-Jan-03



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# FY01 PEM Program Sites



**Barksdale AFB  
Base Housing**



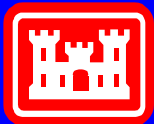
**Fort Jackson  
Officer's Quarters**



**Fort Bragg  
Office Building**



**Brooks AFB  
Base Housing**



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# FY01 PEM Program Sites



Watervliet Arsenal  
Officer's Quarters



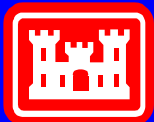
Fort McPherson  
Base Housing



Geiger Field  
Maintenance Facility



Coast Guard Station  
Administration Building

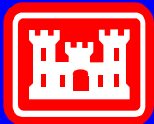


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# FY02 Residential PEMFC Demonstration Program

Site Name	Building Application	Fuel Cell Manufacturer	Input Fuel	Size (kW)	No. Units	Cogen. Y/N
Saratoga Springs NSU, NY	Base Housing	Plug Power	Natural Gas	5	8	Yes
West Point Military Academy, NY	Officer's Quarters	Plug Power	Natural Gas	5	3	Yes
USCG Aids to Navigation Team, RI	Maintenance Facility	Nuvera	Natural Gas	3.7	2	No
Selfridge ANGB, MI	Fire Station	Plug Power	Natural Gas	5	2	Yes
Robins AFB, GA	Fire Station	Plug Power	Natural Gas	5	1	Yes
NCA&T University, NC	Reserve Officer Training Corps (ROTC) Facility	Plug Power	Natural Gas	5	1	Yes
Shaw AFB, SC	Base Housing	Plug Power	Natural Gas	5	1	Yes
McChord AFB, WA	FAA Radio Transmitter	Avista Labs	Hydrogen	3	1	No

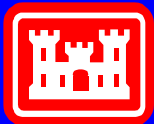


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# FY02 Residential PEMFC Demonstration Program

Site Name	Proposer	Fuel Cell Start-up	Demo End Date
Saratoga Springs NSU, NY	Plug Power	29-Apr-03	N/A
West Point Military Academy, NY	Plug Power	2-May-03	N/A
USCG Aids to Navigation Team, RI	Nuvera	N/A	N/A
Selfridge ANGB, MI	DTE Energy	N/A	N/A
Robins AFB, GA	LOGAN Energy	25-Apr-03	N/A
NCA&T University, NC	LOGAN Energy	24-Apr-03	N/A
Shaw AFB, SC	LOGAN Energy	1-May-03	N/A
McChord AFB, WA	Avista Laboratories	17-Apr-03	N/A



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# FY02 PEM Program Sites



**Saratoga Springs NSU  
Base Housing**



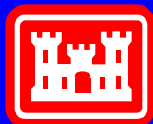
**West Point Military Academy  
Officer's Quarters**



**McChord AFB  
FAA Radio Transmitter**



**NCA&T University  
ROTC Facility**



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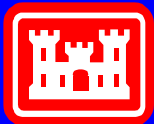
# FY02 PEM Program Sites



**Shaw AFB  
Base Housing**



**Robins AFB  
Fire Station**



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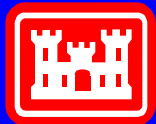
# DoD Residential PEM Program

## Fleet Performance Summary

January 15, 2002 – September 30, 2003

### Program Performance Matrix

Program Year	Total Run Hours	Availability (%)	Capacity Factor (%)	Total Energy Produced (kWe-hrs)	Average Output (kW)	Electrical Efficiency (%)
FY01	118,517	89.9%	45.0%	292,565	2.47	23.1%
FY02	46,728	86.4%	43.5%	117,361	2.51	23.2%
Program Totals/Averages	165,244	88.9%	44.6%	409,926	2.48	23.1%

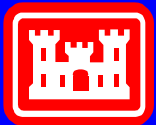


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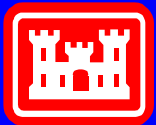
# Residential PEM Program Highlights

- **Watervliet Arsenal**
  - **System B103**
    - 100% Availability Final 4.5 Months
    - 98.8% Availability Final 11.5 Months
  - **System B98**
    - 6742 Cell Stack Run Hours
  - **System B104**
    - 7056 Cell Stack Run Hours



# Residential PEM Program Highlights

- **USMA**
  - Operation During NE Grid Outage, August 2003
- **Saratoga Springs NSU**
  - Operation During NE Grid Outage, August 2003
- **McChord AFB**
  - **Backup Power**
    - 483 Starts / 483 Attempts

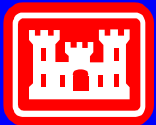


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# DoD Climate Change Fuel Cell Program Objectives

- Reduction of Fuel Cell Prices via Economy of Scale
- Proactive Approach for DoD Involvement



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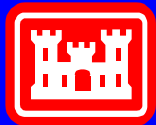
# DoD Climate Change Fuel Cell Program Highlights

- **Grant Money Available / Fiscal Year**

FY03	~\$6.0M
FY02	\$ 2.8M
FY01	\$ 0.0M
FY00	\$ 1.75M
FY99	\$ 1.88M
FY98	\$ 3.4M
FY96/97	\$ 6.8M
FY95	\$ 7.6M

- **Cost-Shared Program Incentives**

\$1,000 / kW up to 1/3 of the total cost

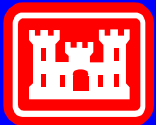


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# Application Rating Criteria

- Firmness of Financial Commitment (15%)
- Site Information (15%)
- DoD Relationship (40%)
- Project Merit (30%)



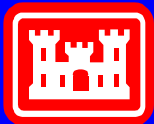
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# DoD Climate Change Fuel Cell Program Totals

Current as of October 2003

Program Totals Matrix			
Program Year	Contracts Awarded	Fuel Cells Awarded	Funding Awarded
FY95	31	38	\$7,600,000
FY96-97	20	34	\$6,800,000
FY98	11	17	\$3,400,000
FY99	4	18	\$1,876,410
FY00	8	8	\$1,750,000
FY02	10	93	\$2,810,000
Total	84	208	\$24,236,410



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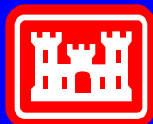
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# DoD Climate Change Fuel Cell Program Totals

Current as of October 2003

Yearly Fuel Cell Totals Matrix				
Program Year	Fuel Cell Manufacturer	Fuel Cell Technology	Fuel Cells Awarded	Fuel Cell Size (kW)
FY95	UTC Fuel Cells	PAFC	38	200
FY96-97	UTC Fuel Cells	PAFC	34	200
FY98	UTC Fuel Cells	PAFC	17	200
FY99	UTC Fuel Cells	PAFC	8	200
	IdaTech	PEM	9	3
	Fuel Cell Energy	MCFC	1	250
FY00	UTC Fuel Cells	PAFC	5	200
	Fuel Cell Energy	MCFC	3	250
FY02	UTC Fuel Cells	PAFC	7	200
	Fuel Cell Energy	MCFC	4	250
	Plug Power	PEM	82	5



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# DoD Climate Change Fuel Cell Program Totals

Current as of October 2003

Fuel Cell Totals Matrix			
Fuel Cell Manufacturer	Fuel Cell Technology	Fuel Cells Awarded	Fuel Cell Size (kW)
UTC Fuel Cells	PAFC	109	200
IdaTech	PEM	9	3
Plug Power	PEM	82	5
Fuel Cell Energy	MCFC	8	250
Total		208	



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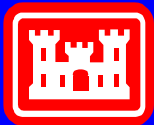
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# DoD Fuel Cell Test & Evaluation Center (FC*Tec*)



**FC*Tec* Site - Johnstown, PA**

**[www.fctec.com](http://www.fctec.com)**

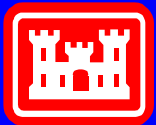


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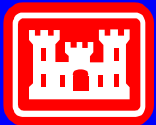
# ***FC*Tec Description**

- The *FC*Tec is located in Johnstown, PA at Concurrent Technologies Corporation's (CTC's) Environmental Technology Facility.
- The *FC*Tec is a National Resource for the independent, unbiased testing and validation of fuel cell power plants for military and commercial applications.
- *FC*Tec's primary goal is to significantly accelerate the development and commercialization of fuel cell power plants.



# **FC*Tec* Services**

- **Independent Demonstration and Validation of Fuel Cell Power Plants Up to 550 kW**
- **Testing Fuel Cells Continuously, 24 Hours a Day, 7 Days a Week**
- **Providing Computerized Process Control and Data Acquisition Capability Including Protected, Internet Data Access**

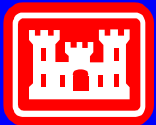


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# **FC*Tec* - Benefits**

- **Accelerated Development of Fuel Cell Power Plants**
- **Access to Both Government & Industry Clients**
- **Designed for Simple Operation, Maximum Flexibility**

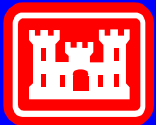


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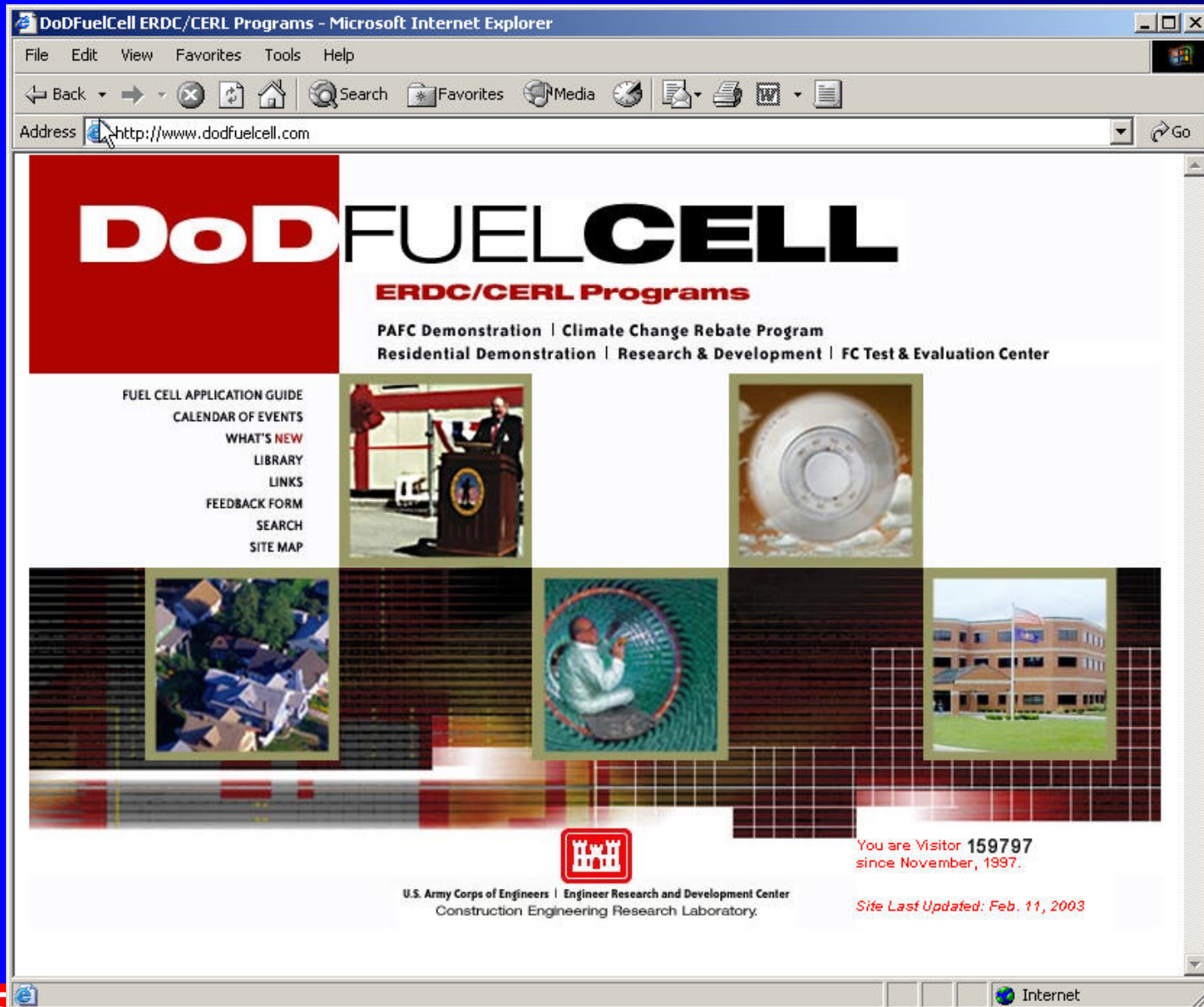
# FC*Tec* Additional Info

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ungerb@ctcgsc.org





[www.dodfuelcell.com](http://www.dodfuelcell.com)



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